

WHAT IS CLAIMED IS:

1. A method of bonding substrates, characterized by comprising:

bringing two substrates into contact with each other via a sealing agent or a liquid substance;

obtaining a positional shift amount between two substrates brought into contact; and

moving at least one of the two substrates by a correction movement amount obtained by multiplying the positional shift amount by a correction coefficient which is larger than 1 to correct a positional shift between these two substrates.

2. A method of bonding substrates, in which one of two substrates is applied with a sealing agent to seal a liquid substance, and the two substrates are bonded to each other by this sealing agent, characterized by comprising:

holding one substrate and the other substrate apart from each other in a vertical direction;

picking up images of the two held substrates to obtain a positional shift amount between the two substrates based on an image pickup result;

positioning two substrates based on the positional shift amount and subsequently bringing these substrates into contact with each other via the sealing agent or the liquid substance;

picking up images of the two substrates brought

into contact to obtain a positional shift amount between the two substrates; and

moving at least one of the two substrates by a correction movement amount obtained by multiplying the positional shift amount between the two substrates brought into contact by a correction coefficient which is larger than 1 to correct a positional shift between these substrates.

3. The method of bonding the substrates according to claim 1 or 2, characterized in that assuming that the correction coefficient is K , the previous correction movement amount of the substrate is M , the previous shift amount between the two substrates is δn , and the present shift amount after moving at least one substrate by the correction movement amount M is δm in a case where correction of the positional shift between the two substrates brought into contact is performed a plurality of times, the correction coefficient K is $K = f(S)$, and $S = M/(\delta n - \delta m)$ is obtained.

4. The method of bonding the substrates according to claim 1 or 2, characterized in that either a set value larger than 1 which is preset or a calculated value obtained by calculation is selectively used as the correction coefficient based on the positional shift amount between the two substrates in a case where correction of the positional shift between the two substrates is performed a plurality of times.

5. The method of bonding the substrates according to claim 1 or 2, characterized in that the correction coefficient is a set value larger than 1.

5 6. The method of bonding the substrates according to claim 1, characterized by further comprising: a measurement step of confirming whether or not there is a shift between the two substrates, after moving at least one of the two substrates to correct the positional shift between these substrates.

10 7. The method of bonding the substrates according to claim 1 or 2, characterized in that the correction movement amount in moving at least one of the two substrates to correct the positional shift between these substrates is a movement amount which offsets the shift amount in a case where a shift is caused between
15 the two substrates after the correction movement.

8. A method of bonding substrates, characterized by comprising:

20 bringing two substrates into contact with each other via a sealing agent or a liquid substance;

obtaining a positional shift amount between two substrates brought into contact; and

25 moving at least one of the two substrates by a correction movement amount obtained by multiplying the positional shift amount by a correction coefficient to correct the positional shift amount between these two substrates.

9. An apparatus for bonding substrates, in which at least one of two substrates is applied with a sealing agent to seal a liquid material, and the two substrates are bonded to each other by this sealing agent, characterized by comprising:

a holding device which holds one substrate and the other substrate apart from each other in a vertical direction and which relatively drives these substrates in X, Y, Z, and θ directions to bond the two substrates to each other;

an image pickup device which picks up images of the two substrates held by the holding device; and

a control device which obtains a positional shift amount between the two substrates based on an image pickup result of the image pickup device and which moves at least one of the two substrates by a correction movement amount obtained by multiplying the positional shift amount by a correction coefficient which is larger than 1 to correct a positional shift between these substrates.

10. The apparatus for bonding the substrates according to claim 9, characterized by further comprising:

a storage device which sets a threshold value concerning the positional shift amount between the two substrates, a set value larger than 1, which is the correction coefficient, and an equation by which the

correction coefficient is calculated,

wherein the control device selects use of the set value larger than 1, set in the storage device or use of a calculated value obtained by the equation as the correction coefficient based on the positional shift amount between the two substrates.

11. The apparatus for bonding the substrates according to claim 9, characterized in that the image pickup device comprises:

10 a first image pickup device which picks up images of the two substrates held apart from each other in the vertical direction;

a second image pickup device which picks up images of the two substrates brought closer to each other as compared with an image pickup time by the first image pickup device and whose image pickup magnification is higher than that of the first image pickup device; and

a positioning device which positions at least one of the first and second image pickup devices in accordance with an image pickup position at a time when the images of the substrates are picked up by the first and second image pickup devices.

12. The apparatus for bonding the substrates according to claim 9, characterized in that the control device comprises: a storage device in which the positional shift amount between the two substrates obtained from an image pickup result of the image

pickup device upon every correction is stored in order to calculate the correction coefficient in a case where correction of the positional shift of the substrates is performed a plurality of times.

5 13. The apparatus for bonding the substrates according to claim 12, characterized in that assuming that the correction coefficient is K , the previous correction movement amount of the substrate is M , the previous shift amount between the two substrates is δn ,
10 and the present shift amount after moving at least one substrate by the correction movement amount M is δm , the control device calculates the correction coefficient K based on equations of $K = f(S)$, and $S = M/(\delta n - \delta m)$.

15 14. An apparatus for bonding substrates, in which an upper substrate held on an upper stage is bonded to a lower substrate disposed to face the upper substrate and held on a lower stage via an adhesive, the apparatus characterized by comprising:

20 an elastic member interposed between the upper stage and the upper substrate or between the lower stage and the lower substrate;

 a detection device which detects a deformation amount of the elastic member in a horizontal direction;
25 and

 a driving control device which moves the upper stage relative to the lower stage, based on the

deformation amount detected by the detection device.

15. The apparatus for bonding the substrates according to claim 14, characterized in that a vertical elastic coefficient of the elastic member is smaller
5 than a transverse elastic coefficient, and the elastic member is elastically deformed in accordance with the vertical elastic coefficient, when moved in a direction in which the upper substrate is bonded to the lower substrate.

10 16. An apparatus for bonding substrates, in which an upper substrate held on an upper stage is bonded to a lower substrate disposed to face the upper substrate and held on a lower stage via an adhesive, the apparatus characterized by comprising:

15 an elastic member interposed between the upper stage and the upper substrate or between the lower stage and the lower substrate;

a detection device which detects a positional shift amount of a horizontal direction between the
20 upper stage and the upper substrate or between the lower substrate and the lower stage via the elastic member; and

a driving control device which moves the upper stage relative to the lower stage, based on the
25 positional shift amount detected by the detection device.

17. The apparatus for bonding the substrates

according to claim 16, characterized in that the detection device comprises a strain gauge which measures a deformation amount of the elastic member.

18. The apparatus for bonding the substrates according to claim 16, characterized in that the driving control device is constituted to restrict a relative movement amount between the upper and lower stages based on the positional shift amount.

19. A method of bonding substrates, in which an elastic member is disposed between an upper stage and an upper substrate held on the upper stage or between a lower stage and a lower substrate held on the lower stage, and a positioning operation of the upper and lower substrates is performed in a contact state via intervening materials such as an adhesive to bond the substrates to each other via the adhesive, the method characterized by comprising:

superposing the upper substrate upon the lower substrate via the intervening materials;

controlling a relative position between the upper stage and the lower stage after superposing the upper substrate upon the lower substrate via the intervening materials to perform the positioning operation between the upper and lower substrates;

detecting a deformation amount of the elastic member in a horizontal direction after positioning the upper substrate with the lower substrate; and

moving the upper stage relative to the lower stage
in a direction in which the deformation amount of the
elastic member is reduced after detecting the
deformation amount of the elastic member in the
5 horizontal direction.

20. A method of bonding substrates, in which an
elastic member is disposed between an upper stage and
an upper substrate held on the upper stage or between a
lower stage and a lower substrate held on the lower
10 stage, and a positioning operation of the upper and
lower substrates is performed in a contact state via
intervening materials such as an adhesive to bond the
substrates to each other via the adhesive, the method
characterized by comprising:

15 superposing the upper substrate upon the lower
substrate via the intervening materials;

controlling a relative position between the upper
stage and the lower stage after superposing the upper
substrate upon the lower substrate via the intervening
20 materials to perform the positioning operation between
the upper and lower substrates;

obtaining a horizontal shift amount of the upper
or lower substrate after positioning the upper and
lower substrates with respect to each other, based on
25 deformation of the elastic member held between the
upper or lower substrate and the stage holding the
substrate; and

moving the upper stage relative to the lower stage
in a direction in which the horizontal positional shift
amount is reduced after obtaining the horizontal
positional shift amount between the substrate and the
5 stage based on the deformation of the elastic member.

21. The method of bonding the substrates according
to claim 20, characterized in that for the positioning
of the upper substrate with the lower substrate,
a relation of the positional shift amount between the
10 upper and lower substrates relative to a deformation
amount of the elastic member generated at a time of
correction of the positional shift amount is obtained
beforehand, and the upper and lower substrates are
positioned based on a correction movement amount
15 obtained by adding the deformation amount of the
elastic member in accordance with the positional shift
amount to the positional shift amount between the upper
and lower substrates.

22. The method of bonding the substrates according
20 to claim 20, characterized in that the horizontal
positional shift amount between the substrate and the
stage is calculated based on the deformation amount of
the elastic member measured by a strain gauge.

23. The method of bonding the substrates according
25 to claim 20, characterized in that the moving of the
upper stage relative to the lower stage in the
direction in which the horizontal positional shift

amount is reduced comprises: imposing a restriction on a amount of relative motion of the upper and lower stages.

24. A method of bonding substrates, in which an
5 elastic member is disposed between an upper stage and an upper substrate held on the upper stage or between a lower stage and a lower substrate held on the lower stage, and a positioning operation of the upper and lower substrates is performed in a contact state via
10 intervening materials such as an adhesive to bond the substrates to each other via the adhesive, the method characterized by comprising:

superposing the upper substrate upon the lower substrate via the intervening materials;

15 controlling a relative position between the upper stage and the lower stage after superposing the upper substrate upon the lower substrate via the intervening materials to perform the positioning operation between the upper and lower substrates;

20 releasing either the holding of the upper substrate by the upper stage or the holding of the lower substrate by the lower stage after positioning the upper substrate with the lower substrate; and

25 bonding the upper substrate to the lower substrate after releasing the holding of the upper or lower substrate.